

REMARKS

This Reply is in response to the Office Action mailed September 23, 2004 and is accompanied by a petition for a one-month extension of time together with an authorization to charge Deposit Account No. 50-0951 for the extension.

In the Office Action, claims 1-13 were pending. All claims were rejected based on cited art.

In this Reply, claims 1-3 have been amended, and new claims 20-22 have been added. No new matter has been added.

Turning to claim rejections based on cited art, Claims 1-3, and 6-12 were rejected under 35 U.S.C. § 103(a) based on Velasquez et al. (U.S. 6,467,156). Claims 4, 5 and 13 were rejected under 35 U.S.C. § 103(a) based on Velasquez in view of Mas et al. (U.S. Pat. No. 6,348,283).

According to the Examiner regarding Velasquez:

Velasquez teaches a method of assembling a storage battery comprising simultaneously depositing current collectors (terminals) on platens, laminating them on individual electrodes in a biccil (col. 13, lines 20-30; col. 14, lines 45-55) and moving the terminals from a first position at a laminating station 103 (col. 13, lines 10-30) to a second, or subsequent position at a fusion station 149 (col. 14, lines 45-55). The fusion station 149 includes a pair of platens (153) for compressing and heating the biccil battery 151 to cause the various layers to fuse together, embracing Applicant's aligning plates, by aligning biccils for contact with the terminals. See Figure 3. The biccil and terminal are sealed in a packaging (col. 13, lines 1-10).

10). The bicells are compression sealed and heated with a pair of plate4ns (col. 14, lines 45-60). The electrolyte is injected into the bicells at a filling station (col. 15, lines 34-40) and the packages are sealed using heated platens (col. 14, lines 40-55). The constituents of the cell may be cut to size during the assembly process (col. 14, lines 45-60).

Velasquez does not expressly disclose sequentially depositing the terminals on the pallet in a first position, then contacting the terminals to bicells in a second position.

However, it would have been obvious to one of ordinary skill in the art at the time the instant invention was made to sequentially deposit the terminals on the pallet in a first position, then contact the terminals to bicells in a second position, selection of any order of performing process steps is *prima facie* obvious in the absence of new or unexpected results. *In re Burhans*, 154 F.2d 690, 69 USPQ 330 (CCPA 1946).

Before reviewing Velasquez, Applicants will first review the claimed invention as recited in amended claim 1. Amended claim 1 recites a method of assembling a storage battery (10), comprising the steps of:

- (A) depositing terminals of said battery on a pallet at a first position;
- (B) moving said pallet to a second position; and
- (C) contacting said terminals with a plurality of bicells in said second position,

wherein said bicells are aligned with one another and for contact with said terminals using an alignment plate.

Thus, amended claim 1 recites aligning a plurality of bicells in the second position for alignment with one another and for contact with the terminals using an alignment plate.

Applicants emphasize that the claimed invention relates to *already laminated electrodes and prior extracted bicells, not heat and associated processes for the lamination of the electrodes into bicells* (the focus of cited reference Velasquez).

In a preferred embodiment recited in amended claim 2, the alignment plate is disposed in opening in the pallet such that edges of a top surface of alignment plate are elevated above edges of the pallet (see Applicants Fig. 3). This receiving position of the alignment plate

allows a more accurate alignment of bicells onto plate and for the grids to be in contact with the terminals.

In the context of producing a Lithium polymer (LiPo) battery, if the bicells comprising the batter are not accurately aligned with each other and to the terminals, it is known that the final product may be compromised. Such inaccuracies result in reduced quality, or even function of the battery. The invention provides an improved process of building batteries that significantly improves alignment of bicells and minimizes or eliminate such problems.

Velasquez is discloses a method of fabricating electrochemical cells and batteries wherein the successive anode and cathode layers are separated by a polymeric electrolyte layer having a protruding polymer edge around its perimeter which reduces the likelihood of inadvertent contact between the anode and cathode current collectors is provided. The polymer edge functions as a non-conducting physical barrier positioned between adjacent current collectors. As will be demonstrated in more detail below by Applicants, Velasquez relates to heat and associated processes for the lamination of the electrodes into individual bicells and does not disclose or suggest anything inventive with respect to assembling together fully a plurality of completed bicells, the focus of Applicants' claimed invention being alignment of a plurality of such fully completed bicells.

Applicant respectfully disagrees with many of the Examiners assertions above regarding Velasquez. To clarify what is actually disclosed by Velasquez, Applicants have copied col. 13, line 9 to col. 15, line 6 (which is relative to Fig. 3 cited by the Examiner) to review the process flow disclosed in a paragraph by paragraph fashion to clarify what is *actually* happening at each disclosed process step.

Col. 13, lines 9-31 discloses:

An apparatus 101 for preparing an electrochemical cell according to an embodiment of the present invention is shown schematically in FIG. 3. The apparatus 101 preferably

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includes a first laminating station 103. At the first laminating station 103, *an anode current collector 105 is laminated to at least one anode material film 107 on at least one side of the anode current collector, and, more preferably, is laminated to anode material film 107 on both sides of the anode current collector, to form an anode precursor 109*. The anode current collector 105 preferably includes an extending anode tab 111 extending past an edge 113 of the anode film, and the anode material film preferably includes, as discussed above, a first polymer, an intercalation carbon material, and a first plasticizer. The anode tab 111 may be provided by, for example, laminating the anode material film 107 over less than a complete width of the anode current collector 105. The first laminating station 103 preferably includes compressive elements such as nip rollers 115 for continuously laminating the anode current collector 105 to the anode material film or films 107, or compressive elements such as platens for intermittently laminating the anode current collector and the anode material film or films. (italics for emphasis only)

First laminating station 103 forms anode precursor 109 by laminating anode current collector 105 to at least one anode material film 107 on at least one side of the anode current collector 105, and preferably on both sides of the anode current collector 105. Clearly a bicell is not yet present since the cathode and electrolyte have yet to be added. A platen is also not yet present. Accordingly, the Examiner's assertion that Velasquez teaches "depositing current collectors (terminals) on platens, laminating them on individual electrodes in a *bicell* (col. 13, lines 20-30; col. 14, lines 45-55)" is clearly not what is disclosed above.

Col. 13, lines 31-49 discloses:

The apparatus 101 preferably includes a second laminating station 117, similar to the first laminating station 103. At the second laminating station 117, a cathode current collector 119 is preferably laminated to at least one cathode material film 121 on at least one side of the cathode current collector, and more preferably, is laminated to cathode material film on both sides of the cathode current collector, to form a cathode precursor 123. The cathode current collector 119 preferably includes an extending cathode tab 125 extending past an edge 127 of the cathode material film 121, and the cathode material film preferably includes a second polymer, a cathode active material, and a second plasticizer. The cathode tab 125 may be formed in the same manner as the anode tab 111. As with the first laminating station 103, nip rollers 129 or platens or other suitable compressive elements are preferably provided at the second laminating station 117 for laminating the cathode current collector 119 and the cathode material film 121.

Second laminating station 117 forms cathode precursor 123 by laminating cathode current collector 119 to cathode material film 121 on at least one side of the cathode current collector 119.

Col. 13, lines 50-65 discloses:

A third laminating station 131, preferably identical to the second laminating station 117, is preferably also provided. At the third laminating station 131, a second cathode current collector 133 laminated to at least one second cathode material film 135 on at least one side of the second cathode current collector, and, more preferably, is laminated to cathode material film on both sides of the second cathode current collector, to form a second cathode precursor 137. The second cathode precursor 137 is preferably the same as the first cathode precursor, such that the second cathode material film 135 includes the second polymer, the cathode active material, and the second plasticizer. Like the first laminating station 103 and the second laminating station 117, the third laminating station 131 is preferably provided with suitable compressive elements such as nip rollers 139 or platens or the like.

Third laminating station 131 forms a second cathode precursor 137 analogous to formation of first cathode precursor by second laminating station 117.

Velasquez discloses in col. 13, line 66 to col. 14, line 5:

The anode precursors 109, the cathode precursors 123, and, if provided, the second cathode precursors 137 may, if desired or necessary, be prepared at a site remote from the site at which the remaining steps in the assembly of the electrochemical cell. The apparatus 101 is described as including the first, second, and third laminating stations 103, 117, and 131 by way of example, not of necessity.

Formation of the anode and cathode precursors are clearly not the focus of Velasquez's invention. At this point the electrochemical cell is still clearly yet to be assembled.

Col. 14, line 6 to col. 14, line 16 discloses the first steps in formation of the electrochemical cell:

The apparatus 101 preferably includes an assembling station 141. At the assembling station 141, a polymeric layer 143 including a third plasticizer is interposed between the anode precursor 109 and the cathode precursor 123 such that the polymeric layer prevents direct contact between the anode current collector 105 and the cathode current collector 119. If a second cathode precursor 137 is provided, as is preferred, a second polymeric layer 145 is likewise interposed between the anode precursor 109 and the second cathode precursor, on a side of the anode precursor opposite the first cathode precursor 123.

Polymer layer 145 which will form the electrolyte is interposed between anode precursor 109 and cathode precursor(s) (123 and optional 137). Polymer layer (145) having a protruding polymer edge or strip around its perimeter which is disclosed as reducing the likelihood of inadvertent contact between adjacent anode and cathode current collectors in a

single bicell, as noted above, the assembly of individual bicells being the focus of the Velasquez invention.

Col. 14, lines 17-39 discloses:

At the assembling station 141, the anode precursor 109, the first polymeric layer 143, the cathode precursor 123, the second polymeric layer 145, and the second cathode precursor 137 are preferably all sprayed, by one or more sprayers 147, with acetone or some other suitable material for softening the anode precursor, the first polymeric layer, the cathode precursor, the second polymeric layer, and the second cathode precursor sufficiently so that those elements adhere to one another and are not easily displaced relative to one another. The assembly of the polymeric layer, the anode precursor 109, and the cathode precursor 123 and, if provided, the second polymeric layer 145 and the second cathode precursor 137 is preferably performed by a pick and place type of apparatus such as the one manufactured and sold by Klockner Medipak, 14501 58th Street, Clearwater, Fla. 34620. The anode precursor 109, the cathode precursor 123, and, if provided, the second cathode precursor 137, as well as the polymeric layer or layers, may be cut by a cutter 148 to a desired size corresponding to a desired amount of power desired from a battery to be formed from those components prior to joining the components, as is shown in FIG. 3, and subsequently sprayed with acetone, or may be first sprayed with acetone and joined, and then cut to size.

Automated pick and place is disclosed above as preferably used to assemble the polymeric layer, the anode precursor 109, and the cathode precursor 123 and optional second polymeric layer 145 and the second cathode precursor 137.

Col. 14, line 40 to col. 14 line 55 discloses:

The apparatus 101 preferably includes a fusion station 149. At the fusion station 149, which is preferably part of the pick and place type apparatus described above, the polymeric layer 143 is fused, preferably under heat and pressure, to the anode precursor 109 and to the cathode precursor 123 to form a bicell battery 151. The bicell battery 151 includes the second cathode precursor 137 and the second polymeric layer 145, if those parts are provided. The fusion station 149 preferably includes a pair of platens 153 for compressing and heating the bicell battery 151 to cause the various layers thereof to fuse together. The platens 153 preferably pressurize the components of the bicell battery 151 that is preferably around 40 psi, and heat the components of the bicell battery to a temperature that is preferably around 110 C-160 C.

Fusion station 149 fuses polymeric layer 143 under heat and pressure to the anode precursor 109 and to the cathode precursor 123 to form bicell battery 151. The fusion station 149 preferably includes a pair of platens 153 for "compressing and heating the bicell battery 151 to cause the various layers thereof to fuse together". "The platens 153 preferably pressurize the components of the bicell battery 151 that is preferably around 40 psi, and heat

the components of the bicell battery". Thus platens 153 using heat and pressure fuse together the respective components (anode, cathode and polymer) of bicell 151 to form a single bicell. Platens 153 do not provide an alignment function since they are pressed on the component stack after pick and placement of the respective components to form the stack. Moreover, platens 153 promote fusion of a single bicell 151 at a time.

Applicants agree with the Examiner's assertion that platens 153 are "for compressing and heating bicell battery 151 to cause various layers to fuse together". However, Applicants respectfully disagree with the Examiner's assertion that platen 153 "embracing Applicant's alignment plates, by aligning bicells for contact with the terminals". As noted above, platens 153 clearly do not perform an alignment function, and operate only to fuse a single bicell 151.

Col. 14, line 55 discloses how Velasquez stacks a plurality bicells formed in fusion station 149:

The apparatus 101 preferably includes a stacking station 155, to which a plurality of bicell batteries 151 are moved by the pick and place machine after being fused at the fusion station and at which they are stacked on top of one another to form a stack 157. A presently preferred stack includes nine stacked bicells 151, each bicell including an anode precursor 109, a cathode precursor 123, and a second cathode precursor 137. The apparatus 101 preferably also includes a welding station 159 at which the plurality of anode tabs 111 of the stack 157 are welded to one another and also to a conductive anode lead 161, such as by an inductive welder 163, and at which a plurality of cathode tabs 125 of the stack are welded to one another and also to a conductive cathode lead 165. The conductive anode lead 161 and the conductive cathode lead 165 add strength to the welded anode and cathode tabs which, alone, tend to have little strength, and the conductive anode and cathode leads are preferably formed of a conductive material such as nickel or copper.

Stacking station 155 receives a plurality of bicell batteries 151 which "are moved by the pick and place machine after being fused at the fusion station and at which they are stacked on top of one another to form a stack 157". The stack shown in Fig. 3 includes nine stacked bicells 151, each bicell including an anode precursor 109, a cathode precursor 123, and a second cathode precursor 137.

Although the pick and place using machine disclosed by Velasquez may represent a slight improvement over stacking bicells by hand, Velasquez does not disclose or suggest any alignment plates for aligning the bicells with one another and for contact with the positive and negative terminals. Accordingly, the bicell stacks produced using Velasquez's disclosed apparatus and related method can suffer from significant alignment problems, specifically misalignment of the bicells with each other and to the terminals. Such misalignment is known to compromise the efficiency or even the function of the final product.

In contrast, Applicants' method of assembling a storage battery recited in claim 1 recites includes aligning a plurality of bicells in the second position with one another bicell and for contact with the terminals using an alignment plate. By cooperating together, alignment plate and pallet form an accurate method of manufacture of batteries by aiding in the accuracy of depositing bicells on one another and in contact with the terminals. As described above, the platens disclosed by Velasquez only fuse a single bicell, and do not provide any alignment function. The bicell stack is assembled by Valesquez using conventional pick and place unaided by any mechanical alignment tools, such as Applicants' claimed alignment plate. Since none of the other cited references make up for the deficiencies of Velasquez, Applicants submit that amended claim 1 and its respective dependent claims are patentable over the cited art.

New claim 20 is a method of assembling a storage battery which recites the same inventive contacting step recited in amended claim 1. ("contacting said terminals with at least one bicell, wherein said bicell is aligned for contact with said terminals using an alignment plate"). Unlike claim 1, Claim 20 does not recite the first and second position limitations recited in claim 1. Claim 20 and its dependent claims 21-22 are thus patentable over the cited art since as noted above relative to claim 1 bicell assembly using an alignment plate according to the invention is not disclosed or suggested in the cited art.

Applicants have made every effort to present claims which distinguish over the cited art, and it is believed that all claims are now in condition for allowance. However, the Examiner is invited to call the undersigned (at 561-671-3662) if it is believed that a telephonic interview would expedite the prosecution of the application to an allowance.

Respectfully submitted,

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